

Appl. No. 10/630,823
Amdt. filed April 26, 2006
Reply to Office Action dated Jan. 25, 2006

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1 (Currently Amended). A method for adjusting keystoneing in a projector, comprising:

- (a) using at least a pair of imaging devices an imaging device to sense and identify at least two boundaries defining a projection screen, said imaging devices being integral with said projector;
- (b) determining a transformation to adjust the keystoneing of an image projected from said projector;
- (c) modifying said image projected from said projector in accordance with said transformation;
- (d) projecting said modified image from said projector, wherein said imaging devices and said projector are maintained in a fixed relationship with respect to each other, wherein at least one of said imaging devices is free form being the projector optics from which said image is projected from said projector.

2 (Original). The method of claim 1 wherein said at least two boundaries include a pair of corners of said projection screen.

3 (Original). The method of claim 1 wherein said at least two boundaries include a pair of edges of said projection screen.

4 (Original). The method of claim 1 wherein said at least two boundaries includes four corners of said projection screen.

5 (Original). The method of claim 1 wherein said at least two boundaries includes four edges of said projection screen.

6 (Original). The method of claim 1 wherein said keystoneing includes horizontal adjustment.

7 (Original). The method of claim 1 wherein said keystoneing includes vertical adjustment.

8 (Original). The method of claim 1 wherein said keystoneing includes adjustment in two different directions.

9 (Canceled).

10 (Currently Amended). A method for adjusting keystoneing in a projector, comprising:

- (a) initiating a keystoneing adjustment process by a user input at a location other than said projector;
- (b) using an imaging device to sense an image projected by said projector;
- (c) automatically adjusting the focus of said projector as a response to said initiating said keystoneing adjustment without further input from said user after said initiating of said keystoneing adjustment in response to said user input;
- (d) determining a transformation to adjust the keystoneing of an image projected from said projector;
- (e) modifying said image projected from said projector in accordance with said transformation;
- (f) projecting said modified image from said projector; and

(g) wherein steps (b) through (e) are free from user input apart from initiating said keystoneing adjustment process.

11 (Original). The method of claim 10 wherein step (b) is performed after step (a).

12 (Original). The method of claim 10 wherein said initiating is by pressing a button of said projector.

13 (Original). The method of claim 10 wherein said imaging device is a camera maintained in a fixed relationship with respect to said projector.

14 (Original). The method of claim 13 wherein said camera is offset with respect to a projection lens of said projector.

15 (Original). The method of claim 14 further comprising another imaging device sensing said image.

16 (Previously presented). The method of claim 10 further comprising another imaging device sensing said image.

17 (Original). The method of claim 10 wherein said adjusting is based upon said sensing, said determining is based upon said adjusting, said modifying is based upon said determining, and said projecting is based upon said modifying.

18 (Currently Amended). A method for adjusting keystoneing in a projector, comprising:

(a) initiating a keystoneing adjustment process;

- (b) using an imaging device to sense an image projected by said projector;
- (c) automatically adjusting the focus of said projector in response to initiating said keystoneing adjustment process;
- (d) determining a transformation to adjust the keystoneing of an image projected from said projector;
- (e) modifying said image projected from said projector in accordance with said transformation;
- (f) projecting said modified image from said projector; and
- (g) wherein step (c) is a response to said initiating said keystoneing adjustment without further input from said user after said initiating of said keystoneing adjustment is free from user input apart from initiating said keystone adjustment process.

19 (Original). The method of claim 18 wherein a user initiates said keystoneing adjustment process.

20 (Original). The method of claim 18 wherein a user initiates said keystoneing process using a remote control of said projector.

21 (Original). The method of claim 18 wherein said determining is free from user input.

22 (Original). The method of claim 18 wherein said modifying is free from user input.

23 (Original). The method of claim 18 wherein said determining is based upon user input.

24-44 (Canceled).

44 (Previously presented). A method for determining the location of a screen by a projector using only one imaging device, said method, comprising:

- (a) said only one imaging device receiving an image of a potential said screen;
- (b) said projector performing a median filter operation on said image;
- (c) said projector performing a gradient operation on said image;
- (d) said projector performing a zero-crossing operation on said image to determine edge screen candidates;
- (e) said projector matching pairs of said edge screen candidates;
- (f) said projector using statistical inference to select said matching pairs for said location of said screen, wherein said only one imaging device and said projector are maintained in a fixed relationship with respect to each other, wherein said imaging device is free from being the projector optics from which said image is projected from said projector.

45 (Original). The method of claim 44 wherein steps (a), (b), (c), (d), (e), and (f) are performed in the order of steps (a), (b), (c), (d), (e), and (f).

46 (Original). The method of claim 44 wherein said location is relative to said projector.

47 (Original). The method of claim 44 wherein said image is received by an imaging device.

48 (Original). The method of claim 47 wherein said imaging device includes a one-dimensional sensor.

49 (Currently Amended). A method for adjusting keystoneing in a projector, comprising:

- (a) using ~~an~~ a plurality of imaging devices to sense an image projected from said projector;
- (b) determining a transformation to adjust the keystoneing of said image projected from said projector;
- (c) modifying said image projected from said projector in accordance with said transformation;
- (d) projecting said modified image from said projector, wherein said plurality of imaging devices is free from including the projector optics from which said image is projected of said projector, wherein said imaging devices and said projector are maintained in a fixed relationship with respect to each other, wherein at least one of said imaging devices is integral with said projector and free from being the projector optics from which said image is projected from said projector.

50 (Original). The method of claim 49 wherein at least one of said imaging devices and said projector are maintained in a fixed relationship with respect to each other.

51 (Original). The method of claim 49 further comprising sensing a projection screen by said imaging devices.

52 (Original). The method of claim 49 wherein said modifying includes digital image processing.

53 (Original). The method of claim 49 wherein said modifying includes optical image processing.

54 (Original). The method of claim 49 wherein said modifying includes mechanical image processing.

55 (Currently Amended). A method for adjusting keystoneing in a projector, comprising:

- (a) using an a plurality of imaging devices to sense an image projected from said projector;
- (b) determining a transformation to adjust the keystoneing of said image projected from said projector;
- (c) modifying said image projected from said projector in accordance with said transformation;
- (d) projecting said modified image from said projector, wherein said projector includes calibration parameters characterizing different optical settings of the projector optics from which said image is projected of said projector, wherein steps (a), (b), (c), and (d) are free form user input.

56 (Previously presented). The method of claim 55 wherein said imaging devices is free from including the projector optics from which said image is projected, of said projector.

57 (Original). The method of claim 55 wherein said imaging device includes the projector optics from which said image is projected of said projector.

58 (Original). The method of claim 55 wherein only a single non-projector optics imaging device is included with said projector.

59 (Original). The method of claim 55 wherein said calibration parameters include a lens control parameter.

60 (Original). The method of claim 55 wherein said calibration parameters includes zooming of the lens.

61 (Original). The method of claim 55 wherein said calibration parameters include focusing of the lens.

62 (Original). The method of claim 55 wherein said calibration parameters includes shifting of the lens.

63 (Original). The method of claim 55 wherein said calibration parameters are stored in memory.

64 (Original). The method of claim 63 wherein said memory is in the form of a look up table.

65 (Currently Amended). A method for adjusting a projector to adjust for keystoneing in a projector in response to a user input, said method, comprising:

- (a) using an imaging device to sense a projection screen and initiate a keystoneing process in response to said user input;
- (b) automatically adjusting the focus of said projector as a response to said initiating said keystoneing adjustment without further input from said user after said initiating of said keystoneing adjustment performing auto-focus of said projector in response to said user input;

- (c) automatically adjusting the positioning of an image from said projector as a response to said initiating said keystoneing adjustment without further input from said user after said initiating of said keystoneing adjustment performing auto-positioning of an image with respect to said projection screen in response to said user input;
- (d) automatically adjusting the zoom of said projector as a response to said initiating said keystoneing adjustment without further input from said user after said initiating of said keystoneing adjustment performing auto-zooming of said image with respect to said projection in response to said user input;
- (e) automatically adjusting said keystoneing of said projector as a response to said initiating said keystoneing adjustment without further input from said user after said initiating of said keystoneing adjustment determining a transformation to adjust the keystoneing of an image projected from said projector in response to said user input;
- (f) automatically adjusting the focus of said projector as a response to said initiating said keystoneing adjustment without further input from said user after said initiating of said keystoneing adjustment modifying said image projected from said projector in accordance with said transformation in response to said user input;
- (g) projecting said modified image from said projector, wherein steps (b), (c), (d), (e), and (f), are performed free from user interaction with said projector and free from additional user input after initiation of keystoneing adjustment.

66 (Canceled).

67 (Original). The method of claim 65 wherein said auto-focus focuses said image on said projection screen.

68 (Original). The method of claim 65 wherein said auto-positioning centers said image on said projection screen.

69 (Original). The method of claim 65 wherein said auto-positioning is in response to determining the location of said projection screen.

70 (Original). The method of claim 65 wherein said auto-zooming is in response to determining the location of said projection screen.

71 (Original). The method of claim 65 wherein said transforming is in response to determining the location of said projection screen.

72 (Original). The method of claim 65 wherein said imaging device and said projector are maintained in a fixed relationship with respect to each other.

73-77 (Canceled).

78 (Currently Amended). A method for rotating an image projected from a projector, comprising:

- (a) using an a plurality of imaging devices to sense a projection screen;
- (b) determining a transformation to adjust said image projected from said projector in accordance with the alignment of said projection screen;

- (c) modifying said image projected from said projector in accordance with said transformation;
- (d) projecting said modified image from said projector, wherein said imaging devices and said projector are maintained in a fixed relationship with respect to each other, wherein said imaging devices are is integral with said projector and at least one of said imaging devices is free from being the projector optics from which said image is projected from said projector.

79 (Original). The method of claim 78 wherein said projection screen is rectangular.

80 (Original). The method of claim 79 wherein said image is rectangular.

81 (Original). The method of claim 80 wherein the lower edge of said projection screen is horizontally aligned with respect to a user.

82 (Original). The method of claim 81 wherein the lower edge of said image is horizontally aligned with respect to a user.

83 (Original). The method of claim 78 wherein said modifying is performed after adjusting said image for a keystone effect.

84-85(Canceled)